Air Resources Board

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Linda S. Adams
Secretary for
Environmental Protection

Arnold Schwarzenegger
Governor

October 26, 2010

Mr. Don Fairchild, Manager
Clean Cam Technology Systems
6300 Seven Seas Avenue
Bakersfield, CA 93308

Dear Mr. Fairchild:

The California Air Resources Board (ARB) staff reviewed the emissions test data submitted for a Detroit Diesel 71-series two stroke diesel engine rebuilt with a Clean Cam Technology Systems (CCTS) Detroit Diesel rebuild kit. The CCTS Detroit Diesel rebuild kit emissions data satisfy the ARB's Commercial Harbor Craft Regulation[1] compliance requirements for an existing engine to meet United States Environmental Protection Agency (U.S. EPA) Tier 2 marine engine emission standards or equivalent. ARB is not certifying the engine rebuild kit. Rather, we are approving engines rebuilt with this kit to comply with the Commercial Harbor Craft Regulation U.S. EPA Tier 2 marine engine requirements. The rebuilt engine will have a new label attached identifying the engine as rebuilt with this CCTS Detroit Diesel rebuild kit.

Two sets of emissions test data have been submitted for the CCTS Detroit Diesel rebuild kit. These data sets are summarized in Table 1. Both sets of data showed emissions rates below the U.S. EPA Tier 2 marine engine standards for the 71-series Detroit Diesel engine. The U.S. EPA Tier 2 marine engine standards, which vary with engine size, are summarized in Table 2 below. One set of emissions tests were performed by the University of California, Riverside (UCR) and the other by Southwest Research Institute (SwRI). Both used the ISO 8178 E3 marine propeller duty cycle. The emissions tests were conducted with CARB diesel fuel. The Harbor Craft Regulation allows compliance by demonstrating emissions levels that meet U.S. EPA Tier 2 marine engine emission limits. The emissions test results for particulate matter (PM), nitrogen oxides plus hydrocarbons (NOx+HC), and carbon monoxide (CO) are at or below the U.S. EPA Tier 2 marine engine emission standards for a marine category 1 diesel engine with a per cylinder displacement of less than 1.2 liters/cylinder.

[1] Commercial Harbor Craft Regulation (section 93118.5, title 17, California Code of Regulation (CCR).

Table 1: CCTS Detroit Diesel Rebuild Kit Emissions

Testing CCTS Rebuild Kit	NOx+HC (g/hp-hr)	PM (g/hp-hr)	CO (g/hp-hr)
UCR Test Avg DDC 12V71 (1.16 liter/cyl)	5.21	0.149	0.60
UCR Test Avg DDC 12V71 (1.16 liter/cyl)	4.98	0.145	0.61
SwRI Test DDC 6L71 (1.16 liter/cyl) Rated 210 hp	4.97	0.188	0.75
SwRI Test DDC 6L71 (1.16 liter/cyl) Rated 208 hp	4.88	0.198	0.77
SwRI Test DDC 6L71 (1.16 liter/cyl) Rated 228 hp	5.2	0.217	0.6

The CCTS Detroit Diesel rebuild kit has two variations, one for the 71-series and another for the 92- series Detroit Diesel 2-stroke engines. The 71-series Detroit Diesel engines displace 1.16 liters per cylinder and the 92-series Detroit Diesel engines displace 1.51 liters per cylinder. The Marine Tier 2 standards for these two engine series are different in regard to the PM emission rates. As shown in Table 2, the 71-series Detroit Diesel engines have to be equal to or less than 0.22 g/hp-hr PM to meet the marine Tier 2 standard while the 92-series Detroit Diesel engines have to be equal to or less than 0.15 g/hp-hr PM. The 92-series Detroit Diesel engines have to meet a cleaner PM standard.

Table 2, U.S EPA Tier 2 marine engine standards

Tier 2 Standards for Category 1 Marine Diesel Engines by Cylinder Displacement	NOx+HC (g/hp-hr)	PM (g/hp-hr)	CO (g/hp-hr)
0.9<= Disp<1.2 liter/cyl	5.4	0.22	3.7
1.2<=Disp<2.5 liter/cyl	5.4	0.15	3.7

Based on the emissions tests results presented in Table 1 above, the CCTS Detroit Diesel rebuild kit reduces emissions from the Detroit Diesel 71-series two stroke diesel engine to below U.S. EPA Tier 2 marine engine emission standards. Therefore, ARB staff finds that the CCTS Detroit Diesel rebuild kit, when used with a Detroit Diesel 71-series engines, can be used to comply with the emission standard requirement in the Commercial Harbor Craft Regulation for Tier 2 engines. This does not extend to the Detroit Diesel 92-series engines because these engines are required to meet a stricter Tier 2 PM emission standard.

A component parts list for this engine rebuild kit is attached to provide a means to identify the individual parts specific to this rebuild kit. The component parts list may be needed to help resolve any future compliance issues. The CCTS Detroit Diesel rebuild kit requires specific injectors that are not on the attached parts lists.

Table 4 below lists the injectors allowed for the 71-series engines. All of the injectors must be certified by Signal Diesel Injector Service located in Signal Hill, California.

Table 4: CCTS Detroit Diesel Rebuild Kit Fuel Injector Identification

Detroit Diesel Engine	Injector Part #	Certified performance by
71-series	Signal Diesel 7G70	Signal Diesel Injector Service
71-series	Signal Diesel 7G75	
71-series	Signal Diesel 9G75	
71-series	Signal Diesel 9G85	

A CCTS engine label must be installed or placed on an engine rebuilt to comply with the Commercial Harbor Craft Regulation marine Tier 2 requirements.

Should you have any questions or comments, please contact Mr. John Lee, Air Resources Engineer, at (916) 327-5975.

Sincerely,

/s/

Daniel E. Donohoue, Chief
Emissions Assessment Branch

Attachment

cc: John Lee
Air Resources Engineer
Control Strategies Section